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BUREAU OF AGRICULTURAL ECONOMICS

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AIR-OVEN AND WATER-OVEN METHODS SPECIFIED IN THE UNITED STATES OFFICIAL GRAIN STANDARDS FOR DETERMINING THE MOISTURE CONTENT OF GRAIN

AIR-OVEN METHOD

APPARATUS

Metal dishes.—Metal dishes should have diameter about 55 mm, height about 15 mm; should be provided with an inverted slip-in cover fitting tightly on inside.

Air-tight desiccator.—Desiccator should contain reignited quicklime or calcium carbide.

Oven.—Oven should be of triple-walled type (De Khotinsky or equal), capable of being maintained at 130° C. ($\pm 3^\circ$), and provided with an opening for ventilation.

Thermometer.—Thermometer should be 14 inches in length, nine thirty-seconds of an inch in diameter, and calibrated for 6-inch immersion, calibrations to start at the 70° C. point and extend to the 150° point, in 1-degree graduations. Errors in scale graduations should not exceed 0.5° at any point.

DETERMINATION A¹

Weigh accurately approximately 2 to 3 g of the ground, well-mixed sample (Labconco grinder or equal) into covered metal dishes which have been previously dried at 130° C. ($\pm 3^\circ$), cooled in a desiccator, and weighed soon after they reached room temperature. Uncover the sample and dry the dish, cover, and contents in the oven at a temperature of approximately 130° ($\pm 3^\circ$) for 1 hour.

Place the metal dishes in the oven, centering them on the wire shelf as near to the center of the oven as possible.

The oven thermometer should be placed so that its mercury bulb comes within a few centimeters of the metal dishes containing the moisture-test material. After heating the material for 1 hour (timing the interval from that instant when the oven reaches 130° C. *after* the insertion of the metal dishes), cover the metal dishes while still in the oven, transfer them to a desiccator, and weigh them soon after they reach room temperature. Calculate the loss in weight as moisture. Determine the percentage of moisture by dividing the loss in weight due to heating by the weight of the moist sample.

DETERMINATION B (two-stage procedure)

Use previously weighed covered metal dishes (duplicates at least) which have been previously dried at 130° C. ($\pm 3^\circ$), cooled in a desiccator, and weighed soon after they reached room temperature. Fill with the damp grain or seeds whose moisture content is to be determined and weigh the container and its contents. *Note the exact weight of the damp material.*

¹ This procedure may be used on all samples believed to contain 13 percent of moisture or less. If, after oven trials, the sample shows more than 13 percent moisture the two-stage procedure described under Determination B must be followed.

Place the metal dishes and contents (preferably) in a warm place or in a well-ventilated area so that the material will dry reasonably fast and reach air-dry conditions; usually in 14 to 16 hours the grain will reach a moisture content that is in equilibrium with that of the air in the room.

Weigh the metal container and air-dry contents. *Note the loss in weight of the grain or seeds.* Record the moisture lost due to air-drying. Next grind the grain or seed in a suitable burr mill (Labconco or equal) to a fine meal and proceed as described under Determination A.

Calculate the total weight of moisture in the original sample, and from this the percentage of moisture in the original material, in the following way:

Item:

1. Weight of damp sample-----	grams--	27. 2358
2. Weight of sample after air-drying-----	do----	25. 1836
3. Moisture loss due to air-drying-----	do----	2. 0522
4. Weight of air-dry material taken from 130° C. air-oven drying, sum of duplicate weighings-----	grams--	7. 8193
5. Loss of moisture due to oven drying, sum of duplicate deter- minations-----	grams--	. 8108
6. Total weight of moisture in air-dry material, item 2-----	do----	2. 6113
(25.1836 : 7.8193 :: X : .8108).		
7. Total weight of moisture in damp sample-----	do----	4. 6635
(a) Loss due to air drying-----	2. 0522	
(b) Loss due to oven drying-----	2. 6113	
8. Percentage of moisture in original sample—item 7 divided by item 1-----	percent--	17. 12

WATER-OVEN METHOD

APPARATUS

Metal dishes.—Metal dishes should be same as described under apparatus for the 130° C. air-oven method.

Air-tight desiccator.—Desiccator should be of the same type as described under the 130° C. air-oven method.

Oven.—Oven should be of water-jacketed type so heated that the temperature in the center of the oven, when the water is boiling, registers 99° to 100° C. at a pressure of 760 mm.

Thermometer.—Thermometer should be 14 inches in length, nine thirty-seconds of an inch in diameter, and calibrated for 6-inch immersion, calibrations to start at the 70° C. point and extend to the 150° point in 1° graduations. Errors in scale graduations should not exceed 0.5° at any point.

DETERMINATION

Use covered metal dishes (duplicates at least) which have been previously dried at 100° C., cooled in a desiccator, and weighed, after they reached room temperature. Fill with the damp grain or seeds whose moisture content is to be determined and weigh the container and its contents. *Note the exact weight of the damp material.*

Place the metal dishes and contents in the water oven and heat the grain or seeds at the temperature of boiling water (99°–100° C.) for 96 hours. At the end of this heating period cover the metal dishes while still in the oven, transfer them to a desiccator, and weigh them soon after they reach room temperature. Place the metal dishes again in the water oven and heat again for 24 hours. If no further loss in weight has occurred as the result of the heating for the additional 24 hours, calculate the loss in weight as moisture. If further losses occur during the 24 hours additional heating, heating must be continued until the loss in weight becomes reasonably constant. For this purpose, changes in moisture percentage not exceeding 0.05 percent can be considered as constant. Calculate the loss in weight as moisture. Calculate the percentage of moisture by dividing the loss in weight due to heating by the weight of the moist sample.